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Railway Age

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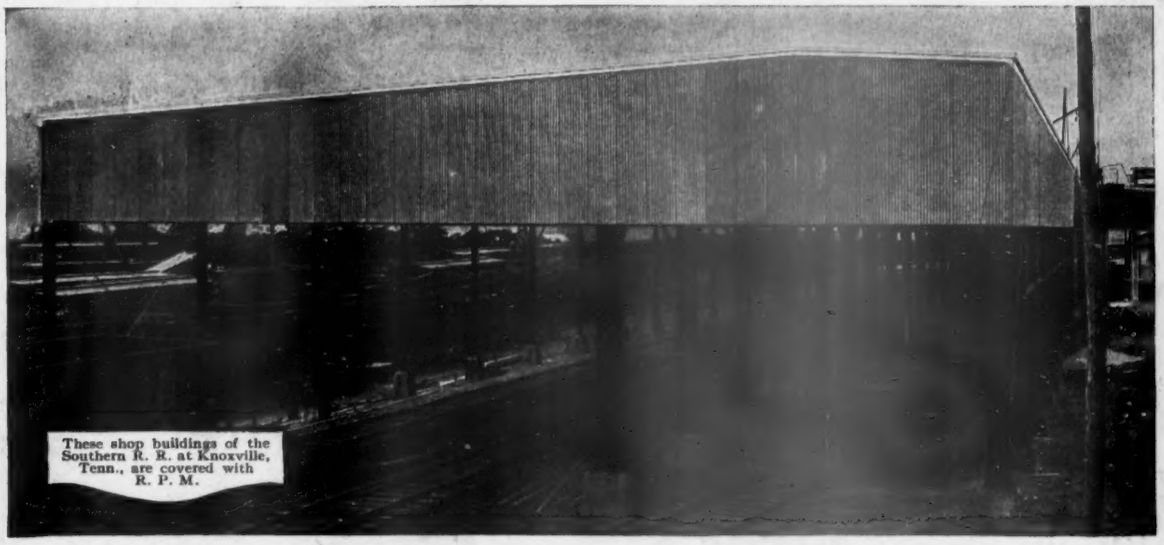

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American Car & Foundry Co.	1913	20 orders
American Locomotive Co.	1913	14 orders
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Chicago, Burlington & Quincy	1920	6 orders
Chicago & Northwestern	1908	11 orders
New York, New Haven & Hartford	1914	7 orders
Pennsylvania Lines	1908	104 orders
Southern Railway	1915	7 orders
Union Pacific	1909	23 orders

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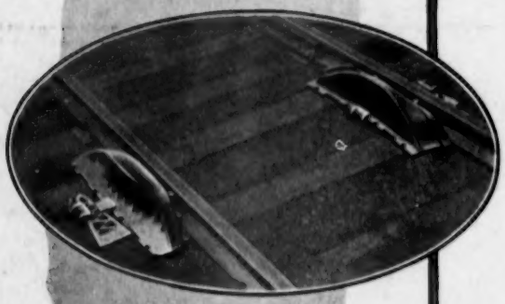

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Railway Age

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DAILY EDITION

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Why Not Label Exhibits?

Many visitors at the National Railway Appliances exhibit at the Coliseum do not have an opportunity to talk to representatives of the different companies about their products on exhibit and as a result they only casually glance over the contents of the booths. In this way, many an interesting point or special feature of a device is overlooked by those whom the exhibitors wish to reach. Because of this fact, some few exhibitors have labeled their various devices with attractive placards, to bring out the points of interest regarding them. Unfortunately, many other companies have made no effort to do this. It is to be hoped that this expedient may receive more general application next year. In this way greater interest will be manifested in the exhibit as a whole and in many individual devices as well.

L. A. Downs Presiding Officer

The American Railway Engineering Association has shown wisdom in the selection of its presidents. As men with executive training they have manifested skill in conducting the sessions. Be this as it may, few of the past presidents, if any, have equalled the record of President Downs as presiding officer. With a voice which could be heard in the remote corners of the hall, he set an excellent example for clear and distinct speech, so necessary in the Florentine room, but his real service to the association was in the expeditious conduct of the transactions. The organization has grown to be a large one; the committee reports are voluminous, and it is only by strict adherence to the business in hand that the program of the convention may be completed. It is possible that some committee reports were not given as much time as they deserved. However, there is no question but that the time available in the five short sessions was applied in the most profitable manner under the able leadership of President Downs.

Further Consideration of Hotel Facilities

From the comments which have come to our attention it is evident that the suggestion made in yesterday morning's daily that the Board of Direction of the American Railway Engineering Association give more attention to the hotel facilities necessary to house the convention properly, have been misunderstood in some quarters. It is a fact that the Congress hotel was unable to care for all of those who desired rooms, but the same would be true of any hotel which might endeavor to house as large an organization as this. It is not to be hoped that all of the members who desire can be taken care of in any hotel, particularly those who make reservations late or who come without reservations. The principal criticism has been with the inability of all who desired to secure seats in the convention in the Florentine room. This condition indicates the necessity for the Board of Direction considering the advisability of transferring the convention to the Gold room in the same hotel, which room will seat more than twice as many as the Florentine room. It is unfortunate that arrangements were not made for the convention to be held there this year, particularly since the hotel was in a position to offer this room until a late date. If our editorial of yesterday morning was not understood, it was because of the fact that we did not make reference to the Gold room, thinking that all of the members knew of it.

Buying With Savings Produced

Not long ago a manufacturer of railway equipment approached the president of a large road with figures showing that an investment in this equipment would yield the road a return of 18 per cent. The president's reply was, that if he had the money which the investment in this equipment would require he could put it to other uses on the line where it would yield even larger returns and that these other investments must therefore receive first consideration. There is, therefore, competition between manufacturers of non-competing equipment for the funds which the railways have available for investment. Numerous recent developments in equipment and materials offer possibilities for large reductions in cost, frequently sufficient to pay for the equipment within a relatively short time. Railway officers are unusually alert for opportunities to effect savings at the present time. Under these conditions the manufacturers of equipment

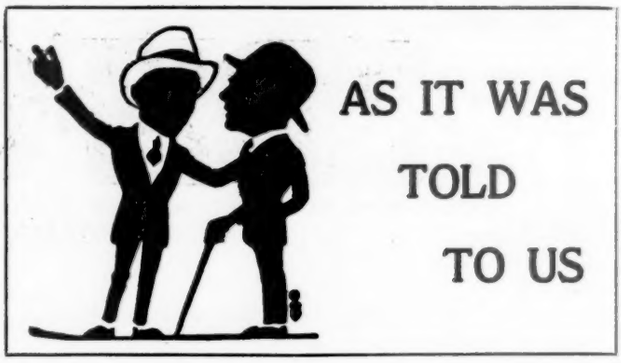
which will produce economies in a limited time are sure of securing a hearing. That the manufacturers are alive to this condition was evident at the Coliseum this week, where a number of devices were offered with the understanding that if they did not produce the economies which would pay for them in the course of a short time they could be returned. As earnings are improving and as the necessity for the restriction of expenditures is being correspondingly decreased, the roads are in a better position to avail themselves of new equipment of this character.

Is Your Road Represented?

For some years the American Railway Engineering Association has been confronted with a serious problem in determining the committee personnel because of the rapid increase in the number of members. Thus in only ten years the membership of the association has practically doubled, while but little increase has occurred in the number of places on committees. At present there are about 2,000 members and only 500 places on committees, so that only one man in four can participate in the committee work.

In one sense this is not an unmixed evil. It affords considerable choice in the selection of the committee personnel, which, theoretically at least, is governed by considerations of special qualification and training, and partly by a due allowance for geographic distribution and proportionate representation by the railways. However, as the Association is one of individuals rather than of railways the last consideration is not a primary one.

There is no question but that the officers and directors of the association are meeting this problem with reasonable discretion and that those who desire places on committees are accommodated in so far as practicable. Actually, personal acquaintance and a degree of interest on the part of the individual play an important part in the determination of committee personnel with the result that some railroads receive much greater representation than others. Excluding the Committee on Electricity, which is concerned with problems peculiar to a small number of roads, there are 22 regular committees with an enrollment of about 450 men, of whom 400 are directly in the employ of railroads. Of this number 119, or 30 per cent, are connected with six roads covering 43,000 miles of line or about 14 per cent of the total railroad mileage of the United States and Canada. This preponderance of representation is easily explained. It means that these six roads are represented in the membership of the association by a large number of men with enough initiative and industry to strive for places on the committee and who show by their efforts that their selection has been well founded. There is, however, one other factor which must not be overlooked and that is the attitude of the railway managements toward participation in association affairs on the part of their officers and employees. If a considerable number of men from any railroad are prominently identified in the work of the association, it is proof positive that they are receiving a considerable measure of encouragement from the management, that their superior officers are also active in the work or that they have been given to understand that attendance at conventions and committee meetings is considered as justifying absence from their places of duty. Railway executives who will review the work of the American Railway Engineering Association in the light of the part which their own men are taking in it may well consider what they can do to see that their roads bear a proportionate share in the work.



Antonio E. Vera, assistant chief engineer, National Railways of Mexico, Mexico City, spent the last two days studying the exhibit at the Coliseum.

* * *

The friends of C. F. Loweth, chief engineer of the Chicago, Milwaukee & St. Paul, among the members of the American Society of Civil Engineers in the vicinity of Chicago, have inaugurated a movement to secure his nomination as a candidate for president of that society. One hundred members signed the original petition and this number is being augmented daily. The members will receive requests from the secretary of the society in April to indicate their preference for nominations for officers in 1923. Mr. Loweth has served the A. R. E. A. as a member of the board of direction during the last three years.

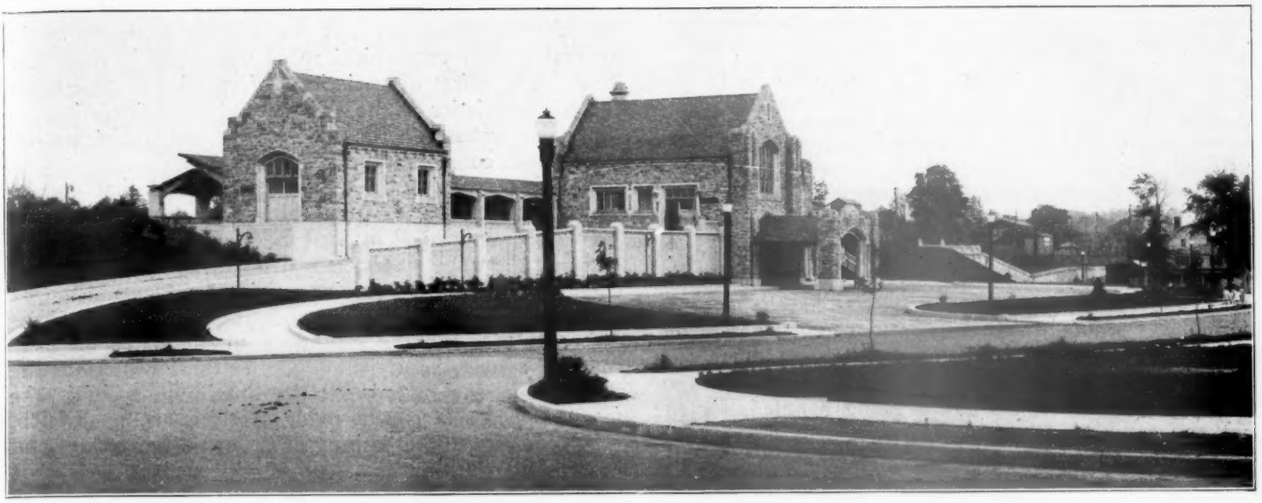
A. R. E. A. Registration

Twenty-six members and eight guests registered yesterday in addition to the 687 members and 172 guests who registered on the two preceding days.

Baldwin, L. W., vice-pres., I. C., Chicago.
Barry, H. B., princ. asst. engr., St. L.-S. F., St. Louis, Mo.
Bassett, J. S., asst. engr., Mo. Pac., St. Louis, Mo.
Dougherty, R. E., des. engr., N. Y. C., White Plains, N. Y.
Farrin, J. M., asst. engr., I. C., Chicago.
Fatherson, T. W., supt., C. G. W., Clarion, Iowa.
Fithian, E. B., div. engr., Mo. Pac., Poplar Bluff, Mo.
Fritch, L. C., vice-pres. in charge of construction, maintenance and capital expenditures, C. R. I. & P. and M. & St. L., Chicago.
Heimerdinger, W. E., asst. engr., C. R. I. & P., Estherville, Ia.
Hodgman, B. B., vice-pres. and ch. engr., National Water Main Cleaning Co., New York.
Irwin, A. Chas., engr., struct. bur., Portland Cement Association, Chicago.
King, H. F., spec. engr., Erie, New York.
Knecht, H. D., asst. engr., Mo. Pac., St. Louis, Mo.
Lewis, E. M., engr. m. of w., C. G. W., Des Moines, Iowa.
Lynch, H. A., asst. engr., B. & O., Wheeling, W. Va.
Mainds, J. S., asst. engr., G. T., Detroit, Mich.
Maynard, R. P., asst. engr., G. N., Hibbing, Minn.
McNally, J. F., asst. supt., A. T. & S. F., Emporia, Kan.
Petersen, W. H., engr. m. of w., C. R. I. & P., Des Moines, Iowa.
Rex, George E., vice-pres., Natl. L. & B. Co., Kansas City, Mo.
Seyton, H. J., dis. engr., G. N., Superior, Wis.
Snyder, H. G., asst. div. engr., B. & O., Garrett, Ind.
Splitstone, C. H., supt. of cons. & surveys, Erie, New York.
Teal, J. E., asst. engr., B. & O., Baltimore, Md.
Westcott, G. R., asst. engr., Mo. Pac., Poplar Bluff, Mo.
Wonson, S. L., br. engr., Mo. Pac., St. Louis, Mo.

Guests

Barrett, P. T., of. engr., C. & W. I., Chicago.
Cayley, W., G. T., Stratford, Ont.
Jaff, S. R., C. B. & Q., Chicago.
Lichbourne W., b. and b. supvr., London, Ont.
Lichty, C. A., gen. insp., C. & N. W., Chicago.
Nims, H. A., railroad contractor, Chicago.
Reinert, W. A., asst. prof. c. e., Armour Institute, Chicago.
Wheaton, F. L., div. engr., D. L. & W., Buffalo, N. Y.



A Suburban Station on the Lackawanna.

Proceedings of the Engineering Association

The Last Day's Sessions Included the Presentation of Seven Reports and Installation of Officers

THE TWENTY-THIRD ANNUAL CONVENTION of the American Railway Engineering Association came to a close at four o'clock yesterday afternoon after the officers had been installed for the coming year. Although it has been the custom of the association in recent years to complete all of its work on the last day in one session, the discussion yesterday morning was so valuable that President Downs permitted it to run at some length, with the result that adjournment was taken at 12:30 until 2 o'clock with three reports held over for the afternoon session. The reports presented were those of the Masonry, Rail, Wooden Bridges and Trestles, Economics of Railway Operation, Buildings, Wood Preservation and Rules and Organization committees.

Report on Economics of Railway Operation

Last year the report and the discussion were largely in respect to the theoretical factors which determine the traffic capacity. For that reason the committee undertook to secure data covering actual phases of operation to substantiate or disprove what had been already covered. The data secured covered 23 operating districts, each being somewhat of a problem in itself and more or less complete. It was found that trains can be operated successfully on multiple tracks against the current of traffic and this method should receive serious consideration when it is necessary to secure increased capacity on lines already seriously congested.

L. S. Rose
Chairman

L. S. Rose has been a member of the committee since its organization in 1918, and is completing his second year as chairman. He has long exhibited a particular interest in the operating phases of engineering problems. As division engineer of the Cleveland, Cincinnati, Chicago & St. Louis for six years and later as signal engineer, he gave much attention to the operating possibilities of engineering improvements. As assistant to the general manager for the last three years he has specialized in the study of methods of promoting economies of operation through the more intensive use of existing facilities, a circumstance beneficial to the Association.

REPORTS ON METHODS for increasing the traffic capacity of a railway, the effect of speed of trains upon the cost of operation and methods for the determination of proper allowances for maintenance of way expenses due to increased use and increased investment are contained in Appendices "A" and "B."

A report on the economical operation of trains against the current of traffic on multiple track railroads is contained in Appendix "D," with definite recommendations.

Action Recommended

1. That the conclusions of the committee given in Appendix D, relating to the economical operation of trains against the current of traffic on multiple track railways, be approved and published in the Manual.

Committee: L. S. Rose (C. C. C. & St. L.), chairman; G. D. Brooke (B. & O.), vice-chairman; E. G. Allen, W. G. Arn (I. C.) J. B. Babcock, 3d (M. I. T.), M. C. Blanchard (A. T. & S. F.), J. M. Brown (C. R. I. & P.), J. W. Burt (C. C. C. & St. L.), M.

Coburn (Penna.), H. H. Garrigues (Penna.), H. B. Grimshaw (S. A. L.), R. B. Jones (C. P. R.), E. T. Howson *(Railway Age)*, E. E. Kimball (Gen. Elect.), F. H. McGuigan, Jr., F. G. Nicholson (C. & E. I.), J. F. Pringle (G. T.), W. G. Raymond (Un. of Iowa), H. A. Roberts (O. W. R. R. & N.), Mott Sawyer (C. M. & St. P.), R. T. Scholes (C. B. & Q.), D. L. Sommerville (N. Y. C.), J. E. Teal (B. & O.), F. H. Watts (Penna.), J. L. Wilkes (Jacksonville Term.), C. C. Williams (Un. of Kans.), Louis Yager (N. P.).

Appendix A—Methods for Increasing the Traffic Capacity of a Railway

Last year the report dealt in part with a few of the physical elements which more or less determine the capacity of a railroad. The discussion was largely academic and requires results of actual operations to prove its value. For this reason the committee undertook to collect data on the physical characteristics of a number of different roads and the traffic which was being handled, for the purpose of noting to what extent the theory was applicable to practical operation. Replies to a questionnaire have been received covering the characteristics and operating data of 23 operating districts.

It has, therefore, been decided to use one or two of the simpler cases which have been worked up to develop the theoretical discussion a step or two farther so that next year wider applications of the theory can be made.

The Determination of the Traffic Capacity—Conclusions

1. The committee has not been able to analyze sufficient data to show how close it is possible to approach the theoretical limit of track capacity in actual practice. Two essentially single track divisions with very few passenger trains have been partially analyzed, but the conclusions which can be drawn from the analyses of these two cases cannot be taken as final. Before making final conclusions it is important to know if there are any other divisions which are doing better with equal facilities and also to secure opinions from those operating these divisions regarding their estimates of how soon additional track facilities will be required.

2. It has been found that train operations can be repsented by a mathematical law, the development of which was given in an Exhibit A of the committee's report.

3. The application of this law to different sets of observations makes it possible to compare several months' operation of a given division on a more equal basis. Likewise operations of different divisions which are more or less similar can be compared on more nearly the same basis.

4. By such comparisons it is felt that the effect of extreme weather conditions, greater track facilities, characteristics of motive power, character of commodities and supervisory methods on the average time on the road can be more accurately determined."

Appendix B—Effect of Speed on the Cost of Operation—Tentative Conclusions

1. Other conditions remaining unchanged, the cost of maintenance of way increases with increased speed of operation.

Exact relation has not been established nor can it be established alike for all conditions of track, roadbed and traffic.

For minor differences in cost due to minor changes in speed not requiring changes in maintenance standards it may be assumed, until experiment proves otherwise, that the cost of maintenance of way varies with speed of operation as set forth in the report of the committee in the Proceedings of 1921 at pages 760 to 772.

2. Cost of transportation will vary materially with variation in speed, but it is not possible to determine in general a most economical speed expressed in miles per hour. The effect of variations of speed will depend on the characteristics of the division under consideration, on the wage system, on the character of the traffic, and on commercial considerations.

a. Since varying speed affects the load that can be hauled, the effect of speed cannot be considered apart from the train load. Provided there are no pusher grades, and that the wage system is a straight hourly pay system, traffic that does not require quick movement is moved most economically in maximum trains, defined to be those that can be handled at minimum speed on the de facto ruling grade of the division. Under these conditions the most economical speed for the maximum train is the fastest speed that can be made safely over the division.

b. Subject to the limiting effect of pusher grades and wage system it may be said that with a given weight of train the most economical speed is the fastest that can be made safely over a division.

c. The operating cost is a minimum under conditions "a" and "b" when the resulting speed is the one which permits the locomotive to be operated at the most economical rate of power production.

Appendix D—The Economical Operation of Trains Against the Current of Traffic on Multiple Track Railways

A questionnaire was sent to the chief operating officers of 48 roads whom it was thought might be able to present information on the subject.

Conclusion

The replies to the questionnaire have demonstrated that trains can be operated successfully on multiple tracks against the current of traffic in the regular course of business, thereby facilitating their movement and effecting material economies without introducing additional hazards when proper precautions are taken; also in some cases avoiding or delaying the construction of additional main and passing tracks. The following is, therefore, recommended for insertion in the Manual:

Operation of trains against the current of traffic on multiple tracks should receive consideration with other methods whenever congestion, delay or overtime prompt investigation of means of facilitating the movement of traffic or increasing the capacity of a line.

Discussion

(The report of the committee was introduced by Chairman Rose and presented in sections by the various chairmen of the sub-committees, the first section dealing with the methods for increasing the traffic capacity of a railway being presented by G. D. Brooke (B. & O.).

Mr. Brooke: The high ratio of actual track capacity to theoretical track capacity which the committee has been able so far to develop has been about 25 per cent and the highest number of trains per day over a single track railroad for a period of a month is a little below 30. There are doubtless engine districts, single track, in the country which are handling more traffic than that, but the railroads have not reported to the committee.

Hunter McDonald: We have on our line a section of about 45 miles, principally mountain road, where we have to operate over a single track a minimum in normal times of practically 60 trains a day, and we sometimes go as high as 90. The success of that operation is brought about by cooperation among the operating men. The average speed of freight trains over that section is

about 8 mi. an hr. We have lately presented a report to our management to the effect that by the installation of automatic signals and complete interlocking and the absolute annulment of all train orders we would increase the capacity of the line to 12 mi. an hr. The investment in one instance represents about $125,000, most of which can be recovered when double tracking is resorted to, as against $2,200,000 for double-tracking. There was also a section of 6 miles of track that was divided into three block controls, and during the 24 years of that operation we moved, if I remember correctly, as high as 119 trains over that single track and 220 trains over the double track.

Mr. Brooke: The committee will be indeed glad to get the information as to this piece of busy railroad. It will be most interesting, I think, for the committee to follow the development of the traffic and to make use of that in developing our studies of the subject.

(J. H. Brown, chairman of the sub-committee on the subject of operating trains against the current of traffic, next presented that section of the report, the conclusion being approved by the association for inclusion in the Manual. Prof. C. C. Williams (U. of Kans.) then presented the portion of the report relating to the effect of speed on the cost of maintenance of way. The committee also reported progress on other subjects assigned to it.)

C. A. Morse (C. R. I. & P.): I was very much interested in what this committee has done. I have had occasion to try to justify the installing of double track more or less in the last 20 years, and every time I went into the literature to find out what had been said on the subject, I found that everybody was steering clear of it. The committee has it in hand and I hope they will keep at it.

(Mr. Morse then cited some practical problems in second track in which the work of the committee would be of value. The committee was then excused with thanks.)

Report of Committee on Buildings

The preparation of specifications for buildings for railway purposes which was begun last year was continued along similar lines and has resulted in the presentation of specifications covering seven subjects. The proper arrangement of icing facilities is found to have important relationship to economies of operation. Duplicate handling such as the back travel of ice must be avoided as well as the use of tunnels, the construction and maintenance of which are expensive. Since the failures of creosoted structures can be attributed largely to untreated surfaces left by sawing, etc., instructions for field treatment are very necessary.

W. T. Dorrance
Chairman

W. T. Dorrance, who is rounding out his second year as chairman of the committee, is designing engineer of the New York, New Haven & Hartford. In his seven years' service with the committee he has had an active part in the constructive work which it has done in standardizing methods of construction of railway buildings and of the materials which enter into them. The report of this year is a continuation in this respect of those of previous years. Mr. Dorrance's experience on the New Haven, with its intensive development in the industrial centers of New England, gives him a fund of information to draw on in directing the committee's work.

THE COMMITTEE PRESENTED specifications covering seven subjects relating to Appendix A. These covered 64 pages, too long to reproduce here. The committee offered as information a report on ice houses and icing stations given in Appendix B. The committee offered as information a preliminary report on floors for railway buildings in an Appendix C. No matter was offered by the committee for approval and inclusion in the Manual.

Committee: W. T. Dorrance (N. Y. N. H. & H.), chairman; J. W. Orrock (C. P. R.), vice-chairman; G. A. Belden (C. of Ga.), Eli Christiansen (C. R. I. & P.), D. R. Collin (architect), Arthur Crable (H. V.), W. L. Darden (S. A. L.), F. M. Davison, J. B. Gaut (G. T.), A. M. Griffin (A. C. L.), A. C. Irwin (Portland Cement Assoc.), F. R. Judd (I. C.), G. A. Mitchell (G. T.), Hugo Filippi (I. C.), R. V. Reamer (C. of N. J.), C. W. Richey (Penna.), G. A. Rodman (N. Y. N. H. & H.).

Appendix B—Ice Houses and Icing Stations

Ordinarily not enough thought is given to arrangement of rooms and machinery. Poor arrangement will increase the cost of filling a house as much as five or more per cent per ton. This also applies to the movement of ice from storage to cars. Some consider the number of rooms an essential point; the larger the number of rooms, the easier to keep things moving smoothly—in fact, the amount of ice that can be harvested is proportionate to the number of rooms. Wide doors are also a help. The doors must be wide enough to admit a chute built so that the ice can run either way—i. e., wider in the clear than the diagonal of the cake.

An icing station of simple constructoin is usually a one-room storage with a gig elevator at one end which runs in a vertical direction through the ante-room annex to the storage room. Below the ante-room is an unloading platform of 3 ft. 6 in. above rail. This is not enclosed. Directly above the ante-room is the crusher room to which block ice is delivered. The gig may be reached at any one of the three elevations or at any elevation from the storage side. The opening to the storage side may be enclosed with hinged doors or boarded up and insulated as the house is filled, removing them as the ice is removed. The floor of the ante-room should be pitched, with a trough or gutter at one side. The ante-room is used mainly as a storage space for block ice and carts for handling crushed ice, which facilitates the quick icing of a train. Platforms are usually 12 ft. wide by 200 ft. or more in length and 16 ft. 6 in. high, running parallel to ice house and directly connected with ante-room of same. These ice houses are usually of frame construction, asphalt shingles, and a straw or hay loft constructed between the collar beams and rafters of the roof construction.

A wall construction that has been successful in this type of house is constructed of 2 by 12 studs, placed 24-in. centers, covered on either side with 1 by 6 D. & M., diagonally, and over this a good, waterproof paper. On the interior an additional layer of 1 by 6 is laid; on the exterior, drop siding. The space between the studs is filled with dry, handmade, white pine shavings or similar material which will not pack. To prevent the passage of

moisture to the insulation above, due to capillary action, it is preferable to fill the lower seven to ten feet of wall with granulated cork.

On the interior surface of the building it is desirable to use a good, waterproof paint, or spar varnish. The underside of the roof rafters should be ceiled up, leaving space at the ends of about two feet, forming a channel parallel with the rafters, allowing a circulating space for the warm air to ascend to ridge of the building. There should be an open monitor on the ridge of the roof. This need not be very high—just enough so that the rain will not beat in, and allow enough space for the warm air to pass out. One of the essential points in wall construction is that careful consideration be given to the sill plate that there be no air leaks. This can be effected by the use of offset joint well coated with car glue or other waterproofing material.

Due to the difference in temperature between the exterior and interior, walls exposed to the sun for a large portion of the day, especially south walls, are liable to warp. To overcome this, an additional air space formed of 2 by 6 studs and one layer of drop siding is built on the exterior face of the building after the storage wall is finished. There should be an open space left at the bottom and top for circulation, allowing hot air to pass out at the top.

The floors of some refrigerated houses are constructed of cinders 12 in. thick and in some cases over this a two-inch plank floor on sleepers has given good results. The floors should pitch slightly toward the center, so that when the house is filled the ice forms an arch and does not throw any stress on the outside walls. In floor construction, water has to be contended with, due to poor drainage, and also where there is a great amount of shrinkage of ice on account of the heat transmitted from the ground.

There seems to be a difference in opinion as to the width of platforms. Some roads build platforms 12 ft. wide; these being constructed of wood posts, joists and 2-in. plank floor, with guide strips for ice of oval iron let down flush with the floor, with slots between for dripping.

On the far side from the track, platforms have a guard railing, usually 3 feet high with electric light poles with an overhanging arm. These poles are generally placed 32 ft. on centers. The arm projects out to the opposite side of the platform so as to get a maximum amount of light at the desired point at side of car. Some roads use island platforms between tracks. This has some advantage, as it allows two trains to be iced at one time.

Salt boxes are installed in connection with platforms. These are spaced about forty feet apart and hung below the floor boards of the platform. The salt is handled by means of a shovel from car to storage box. In some cases elevators are used to carry salt, receiving supply from cars delivered to an overhead bin, using overhead trolley buckets or wheelbarrows to transfer to boxes under platform or other location.

Where crushed ice is handled, loaded wheel carts are stored until train time. Loading is then made by spouts or troughs, which allows for a double deck platform.

Discussion

(The report of the Committee on Buildings was presented by W. T. Dorrance, Chairman, who outlined the work which the committee had been doing during the past year; after which the report was accepted as information by the association and the committee dismissed with the thanks of the association.)

Report of the Committee on Rail

The rail failure statistics for 1920 show that there was a continuous decrease in failures from 1908 to 1914, the latter year being the low one to date, with a gradual increase in failures up to 1917. The figures for 1916 and 1917 are, of course, based on a study for short periods of service. War conditions were believed to be the cause of the increasing number of failures which will probably reach a peak for the year 1917. Data include both Bessemer and open hearth steel. A schedule for the inspection of steel rails was submitted for inclusion in the Manual, consisting of a chief rail inspector, three or more assistant inspectors, some checkers and a chemist.

G. J. Ray
Chairman

G. J. Ray is rounding out his fourth year as chairman and his sixth year as a member of the commitee. He has also been active in other work of the association, having served as chairman of the Track Committee for several years and a member of the Board of Direction from 1914 to 1917, and again for the year now closing. He has been chief engineer of the Delaware, Lackawanna & Western for 12 years, during which time this road has carried on an unusually extensive construction program. Mr. Ray has been a keen student of the rail problem for years, and has pioneered in a number of developments relating to both construction and maintenance.

THE REPORT ON THE RAIL FAILURE STATISTICS for the period ending October 31, 1920, is submitted as Appendix A. The committee in Appendix B presented abstracts of the replies to a questionnaire, a discussion of the methods used for the inspection of steel rails and a schedule of Recommended Practice for Inspection of Steel Rails. The committee recommended that the schedule of recommended practice for the inspection of steel rails, submitted in Appendix B, be adopted and included in the Manual.

Committee: G. J. Ray (D. L. & W.), chairman; J. M. R. Fairbairn (C. P. R.), vice-chairman; E. E. Adams (U. P.), A. S. Baldwin (I. C.), W. C. Barnes, W. C. Cushing (Penna.), P. H. Dudley (N. Y. C.), C. F. W. Felt (A. T. & S. F.), L. C. Fritch (C. R. I. & P.), J. H. Gibboney (N. & W.), A. W. Gibbs (Penna.), C. R. Harding (S. P.), J. D. Isaacs (S. P.), H. G. Kelley (G. T.), H. D. Knecht (M. P.), R. Montfort (L. & N.), A. W. Newton (C. B. & Q.), J. R. Onderdonk (B. & O.), F. S. Stevens (P. & R.), F. M. Waring (Penna.), M. H. Wickhorst, J. B. Young (P. & R.).

Appendix A—Rail Failure Statistics for 1920

By M. H. WICKHORST

This report covers rollings for 1915 and succeeding years and the ages of the rolling would average in track about the years shown below:

1915—5 years	1918—2 years
1916—4 years	1919—1 year
1917—3 years	1920—several months

The tonnages and track miles of rail represented by the statistics in this report are as follows:

Year Rolled	Tons	Track Miles
1915	1,091,876	7,346.50
1916	1,193,905	8,062.10
1917	1,096,395	7,334.40
1918	990,820	6,658.80
1919	989,398	6,676.60
1920	759,071	5,064.20
Total	6,121,465	41,142.60

The average results of all the rails reported on are shown in Table 1, together with the results taken from previous reports, including both Bessemer and open-hearth rails. The measure of the performance of a lot of rails as regards failures is taken as the failures per 100 track miles for five years' service and it will be noted that there was a continuous decrease in the failures from the rails rolled in 1908 with a record of 398.1 to those rolled in 1914 with a record of 74.0. The rails rolled in 1915 showed an increase to 82.4 failures per 100 track miles for five years' service and a study of the records for lesser periods of service indicates that the rails rolled in 1916 and 1917 will show successively increased numbers of failures. This unfortunate performance is probably to be regarded as a by-product of the war and the manufacturing conditions that prevailed during the war and for a while thereafter. Under-maintenance during the same period probably contributed to increase the general failure records, but it is to be noted that the 1914 rails, which have given the best record, also went through the same period of under-maintenance. The general average results for the whole country are presented diagrammatically in Fig. 1. Here again will be noted how the failure curve showed continuous decrease in failures until the present year, which shows an increase. The curve will acquire an ugly hump which we hope will reach its peak in the record of the 1917 rails. As interesting information, the average weight of the rails rolled at each of the mills is presented in Table 2.

In conclusion it may be remarked that the failures had been showing a gratifying decrease from year to year until the World War came on. The "war-time" rollings, however, and particularly the rails rolled in 1917, are not showing up so well, due probably to the unfavorable manufacturing conditions that prevailed when they were made and also to the lack of the usual care in the track that the railroads were able to give them during the same period.

TABLE 1—AVERAGE FAILURES PER 100 TRACK MILES

Year Rolled	Years Service					
	0	1	2	3	4	5
1908						398.1
1909					224.1	277.8
1910				124.0	152.7	198.5
1911			77.0	104.4	133.3	176.3
1912		28.9	32.1	49.3	78.9	107.1
1913	2.0	12.5	25.8	44.8	69.5	91.9
1914	1.2	8.2	19.8	32.9	50.9	74.0
1915	0.7	8.9	19.0	34.2	53.0	82.4
1916	1.6	11.8	29.2	47.7	70.6	
1917	5.3	21.6	38.9	66.0		
1918	1.6	8.9	27.6			
1919	2.0	14.8				
1920	3.9					

TABLE 2—AVERAGE WEIGHTS OF RAILS COMPILED FROM TONNAGES USED IN THIS REPORT

Mill	1915	1916	1917	1918	1919	1920
Algoma	90.1	90.1	85.0		94.2	101.7
Bethlehem	98.6	99.2	103.0	104.3	109.3	120.3
Cambria	102.5	103.4	118.4	118.9	112.1	130.0
Carnegie	98.8	100.7	100.2	104.1	105.6	101.7
Colorado	89.8	89.0	90.4	90.3	89.7	90.5
Dominion				85.0	85.0	
Illinois	93.3	92.9	92.9	93.3	92.1	93.5
Lackawanna	96.7	94.9	97.1	95.3	95.2	96.1
Maryland	104.4	102.8	106.7	104.2	93.6	85.0
Pennsylvania	104.6	102.0		100.0	101.2	103.0
Tennessee	88.1	88.5	87.9	88.3	89.1	88.6
Average	94.6	94.3	95.1	96.1	94.2	95.4

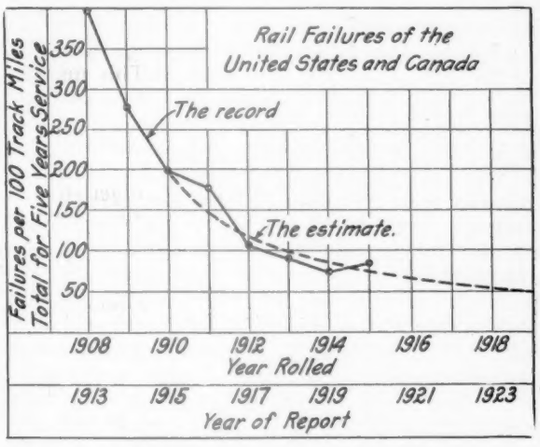
Appendix B—Recommended Practice for Inspection of Steel Rails

1. Chief Rail Inspector.
2. Three or more assistant inspectors as size of mill and rate of rolling may require.
3. One or more checkers, depending upon rapidity of loading.
4. One chemist if check analyses are made in mill laboratory.

1. The chief rail inspector shall supervise the inspection force, mill practice, drop tests and make records.

2. One assistant inspector shall follow the mill practice closely, i. e., time of charging, time of tapping, cutting of tests, etc.; record any irregularities, such as too rapid pouring, charging cold ingots, rolling cold bloom, low finishing temperature, behavior of rails under straightening presses or any other departures from good mill practice which may affect the service of the rails.

3. One assistant inspector for night duty shall make drop tests if necessary and follow the mill practice.



The Rail Failure Record to Date

4. One or more assistant inspectors shall inspect the rails on the loading beds for surface defects, straightness, etc.

5. One or more checkers shall record the number of rails of each heat accepted and loaded in each car. A record of the car number and the number of rails of each heat in the car shall be sent to the division engineer, the supervisor, the roadmaster or other officer to whom the rails are consigned. This prevents the loading of rails rolled from odd ingots, or the loading of more rails than were originally rolled in a heat, or the loading of rails from rejected heats. It also furnishes a check record of the location of the rails if at any time in the future it is desired to remove the rails of a particular heat for any cause whatever.

6. A chemist shall make check analysis of drillings taken from corner of head of the rail, no rails being loaded until the check analysis is finished. The office to which the rail inspection force reports should keep a record of the history of each heat in a convenient form, so the results obtained from the service of the rails may be traced to the manufacture of the steel or rails.

Rail inspectors should be selected with care and men not familiar with rolling mill practice should not be sent to inspect rails except under the supervision of an experienced rail inspector. As far as possible the inspections should be made by the same men, as they then become familiar with the methods of manufacture peculiar to each mill, for no two mills follow the same procedure even though owned by the same company.

Acceptance of heats meeting the technical require-

ments of specifications, but in the judgment of the inspector of inferior quality should be deferred pending decision of engineer of tests after full report and review of conditions; conversely, rejections of heats whose deficiencies may be technical only should be similarly governed. The inspectors cannot be too careful and must exercise good judgment and all possible tact.

Discussion

(The report of the Committee on Rail was presented by G. J. Ray, Chairman, the section under Appendix B, Recommended Practice for Inspection of Steel Rails, being approved by the Association for inclusion in the Manual. The chairman next brought up the question of a revision of the specification which the committee expected to present at this meeting.)

Chairman Ray: During the past season the committee has paid particular attention to mill practice at various mills, and as a result of the studies which have been made the committee thought best to prepare a new specification or to revise the old specification with a view of eliminating segregated steel as far as possible. We have felt it advisable to get the manufacturers to produce the steel in the furnace as far as possible, rather than in the ladle or in ingot. We have before us an experiment specification which has not been passed on by the committee, in which we are endeavoring to get a rail which will be without excessive segregation. This may permit the manufacturer to eliminate the nick-and-break test from the specification. I will say frankly that some of the members of the committee think that it is a mistake to eliminate this test. We do not want to get steel which is piped, but if we permit the manufacturer to roll his steel which contains a pipe in the ingot, rather than segregated steel, we hope to get steel which is safer in the track than much of the steel we get now, which we know is often badly segregated. There is a general impression about piped rails that is not founded on proper knowledge of the situation. If the rail is badly segregated and exceedingly hard, it will be safer on the outside, because the carbon and sulphur are segregated towards the center, and it will break down in the head. That rail is a dangerous rail compared with a piped rail or a rail which has a natural lamination in the center due to the cavity in the top of the ingot. We think that most of the trouble is due to split-head rails, which are caused by bad segregation. Therefore, the specification is gotten up with the idea of producing an ingot which will contain what is known as piped steel rather than segregated steel. We are not looking for piped steel, but we are trying to get away from the segregated steel, and we want to give the manufacturer an opportunity to do that.

C. W. Gennet, Jr. (Robert W. Hunt & Co.): Indisputably the best rails are produced when the steel mills are running constantly, for then the various steps of the process are in better harmony and the machinery and the workmen are keyed to the proper pitch. In 1921 the inspection of approximately two million heavy section rails produced about 4.8 per cent of No. 2 rails and about 1.9 per cent of scrap rails, all so classified because of flaws, which figures are fairly representative of good practice. Of these rails approximately 40 per cent were made to some specification requiring a nick-and-break test from "A" or top rails and then classifying according to the appearance of the fracture. The number of "A" rails condemned because of showing interior defects on the fracture test amounted to 1.3 per cent of the total rolled under such specifications, but the number from one mill amounted to 0.2 of 1 per cent, while that from another mill amounted to 4.2 per cent. These figures emphasize the wide difference that may be found in mill practice.

No important change in any customary mill practice has marked the past year, but of course, the times have not been propitious for making either radical changes or improvements. A new rail manufacturer, the Standard Steel Company, has entered the field, however, and among the facilities for rail-making that have been provided in the mill, are the adaptation for delivering long rails, and the disposition into other products, including tie-plates, of what would ordinarily be the "A" or top-rail metal.

Experience has demonstrated repeatedly that the most constant cause of criticism is the incessant fault found with the action of "A" or top rails in track. It is plain that until the mills generally adopt some method of casting hot-top and big-end up ingots the liability of obtaining piped and segregated unhomogeneous steel in the top rails is so great as to require the adoption of more positive methods for combatting the difficulties. Testing the top rail of each ingot is one method for protecting against the shipment of inferior metal. In lieu of such testing methods, it has now been deemed practicable to provide for the disposition of the "A" rail metal by agreeing to its use in the form of hot worked tie plates. It is hoped that early in the future, more mills may see their way clear to adapt themselves to such manufacture.

It has been suggested that rail steel should contain a higher silicon content than heretofore has been common in this country, although some English rail steel has long been conspicuous for its high silicon. The English steel contains much less carbon than ours does, and the question of possible brittleness in the high carbon steel containing high silicon and perhaps silica, is important for investigation. No doubt, the more extensive use of silicon, if possible, at the mills, will make the steel more homogeneous in some directions, but it is hazardous to expect it to so reduce segregation as to make that evil a matter of history, and seriousness of the increased piping must not be underestimated.

W. C. Cushing (Penna.): Several large railroads have been considering increasing the weight of rail in use on these roads, and studying the design which they should use in making that change. The Rail committee is not ready to make any report on the subject. It has been estimated that the 130-lb. rail on the Pennsylvania System outlasts the 100-lb. section by 2½ times and is worth 23 per cent more in reduced maintenance on heavy curvature districts. It has also been well established that the failures of 130-lb. rail on the Pennsylvania System are many times fewer than those of the 100-lb. section, notwithstanding the fact that they are located where the traffic and alinement conditions are of the severest. I do not believe that the time has come for making any change in the present adopted "RE" sections, especially as the 100-lb. and 130-lb. sections are now rolled.

Hunter McDonald (N. C. & St. L.): I would like to bring to the attention of the Rail committee with as much emphasis as I can the problem that a number of our roads have before them of recommending an increase in rail section. I know that the tendency of most of the roads having dense and heavy traffic has been to make one big jump from a 100-lb. section or perhaps 105-lb. section to as high as 130 and 136-lb. The committee now has under consideration the using of a 150-lb. section, as announced by the chairman. I think the majority of our membership is much more interested in the establishment and stabilizing of the intermediate sections between 100 and 150 than they are in the completion of the 150-lb. section. The question of whether he is likely to strike what will be the future standard

when he goes from a 90-lb. rail to a higher section, is very important, and it devolves upon the engineer making this recommendation to forecast correctly what the final action of the committee is to be. An effort should be made to stabilize this question as quickly as possible.

I would also like to ask the committee if it will not revive the question of using longer rails than 33 ft.

The President: That concludes the report of the committee, and it is dismissed with the thanks of the Association.

Report of Committee on Masonry

The committee recommended that the paragraph dealing with the permissible variation in the fineness of cement be omitted from the Manual since by agreement among the parties interested it has been omitted from the specifications which, as so amended, have been adopted by the American Engineering Standards Committee as tentative standards. The elimination of this clause will make the two specifications identical in content. In view of the advancement in concrete work, it was recommended that certain changes be made in the Manual dealing with consistency, impurities and steel reinforcement so as to keep the specifications up to date.

J. J. Yates
Chairman

J. J. Yates, chairman of the committee, is completing his third year in this capacity and has been a member of the committee since 1912. During this long period of service he has played an important part in the work. He has served as the representative of the Association on the joint committee on specifications for Portland cement and is now vice-chairman of the new joint committee on concrete and reinforced concrete. As bridge engineer of the Central Railroad of New Jersey he has had an opportunity to obtain a first hand contact with a variety of problems relating to concrete, particularly those concerning its use in salt water.

THE COMMITTEE recommended that the following action be taken on its report:

1. That the following requirement as it appears in the 1921 Manual, covering a variation in fineness of cement, be omitted and the remaining paragraphs renumbered. See Appendix A.)

Permissible Variation.—36. A permissible variation of 1 will be allowed, and all results in excess of the specified limit, but within this permissible variation shall be reported as 22 per cent.

2. That the revisions and additions as they appear in Appendix A be issued as a supplement to the Specifications for Plain and Reinforced Concrete and for Steel Reinforcement as it appears in the Manual.

3. That Appendix B covering specifications for cold drawn wire, Abrams' selective concrete strength tests and the colorimetric test of sands be received as information.

4. That an Appendix C reporting progress of the Joint Committee on Specifications for Concrete Pipe be received as information.

5. That the recommendations of the committee as they appear in its Appendix D be approved as the outline work for the ensuing year.

Committee: J. J. Yates (C. of N. J.), chairman; Job Tuthill (P. M.), vice-chairman; J. T. Andrews (B. & O.), R. Armour (G. T.), T. L. Condron (Cons. Engr.), W. A. Christian, J. E. Freeman (Port. Cem. Assoc.), T. L. D. Hadwen (C. M. & St. P.), Dr. W. K. Hatt (Purdue Univ.), S. C. Hollister (Cons. Engr.), Richard L. Humphrey (Cons. Engr.), Noah Johnson (Wabash), S. A. Jordan (B. & O.), W. S. Lacher (*Railway Age*), J. C. Nagle (A. & M. Col.), C. P. Richardson (C. R. I. & P.), F. E. Schall (L. V.), Z. H. Sikes (N. Y. C.), F. P. Sisson (G. T.), G. H. Tinker (N. Y. C. & St. L.), C. C. Westfall (I. C.).

Appendix A—Revision of Manual

Since the adoption of a Specification and Tests for Portland Cement in 1917, the allowance of a variation of 1 per cent passing the No. 200 sieve, as provided in the Tests for the Determination of Fineness, has under an agreement by those interested been omitted from the specification. The specification as amended has been approved on January 15, 1921, as "Tentative Standard" by the American Engineering Standards Committee. The committee is recommending that we omit paragraph 36 in order to make our specification identical.

The Progress Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete was submitted to the constituent organizations June 4, 1921, and it has been issued to the members of the American Railway Engineering Association. It is the recommendation of the Masonry committee that certain changes and additions to the Specifications for Plain and Reinforced Concrete and for Steel Reinforcement be issued as a supplement to the Manual as follows:

For Paragraph 11, on Consistency, substitute the following:

11. (a) The quantity of water used in mixing shall be the least amount that will produce a plastic or workable mixture which can be *properly compacted* in the forms and around the reinforcement. Under no circumstances shall the consistency of the concrete be such as to permit a separation of the coarse aggregate from the mortar in handling.

(b) The Engineer shall determine and specify the consistency of the concrete for various portions of the work based on test of the materials to be used. The consistency of the concrete shall be measured by the slump test (for description of test and methods of making slump tests, see Vol. 22, Proceedings for 1921, pages 553 to 564, inclusive).

(c) The consistency of the concrete shall be checked at the beginning of each daily run, and at least once a day thereafter during the progress of the concreting, or when the size of any aggregate or its moisture condition changes.

Under the general heading of Materials, Paragraphs 1 to 7, inclusive, add the following paragraph:

ORGANIC IMPURITIES IN SAND.—Natural sand which shows a color darker than the standard color when tested in accordance with the Colorimetric Test for Sands (see Appendix B) shall not be used unless the concrete made with the materials and in the proportions to be used on the work is shown by tests to be of the required strength.

As a footnote to the section on Steel Reinforcement, Paragraph 7, add the following:

See Appendix C for "Tentative Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement."

Include under section on Steel Reinforcement the following:

Standard Sizes of Bars. Reinforced bars shall conform to the areas and equivalent sizes shown in Table I.

TABLE I—SIZES AND AREAS OF REINFORCED BARS

Size of Bar Inches	Area, sq. in. Round	Square
⅛	0.110	.....
½	0.196	0.250
⅝	0.307	.....
¾	0.442	.....
⅞	0.601	.....
1	0.785	1.000
1⅛	.....	1.266
1¼	.....	1.563

The areas of deformed bars shall be determined by the minimum cross-section thereof.

Include under Section VI, on Depositing, Paragraphs 23 to 28, the following provision for Spouting:

SPOUTING.—When authorized by the engineer, concrete may be conveyed by spouting, in which case the plant shall be of such size and design as to insure a practically continuous flow in the spout. The angle of the spout with the horizontal shall be such as to allow the concrete to flow without separation of the ingredients. The spout shall be thoroughly flushed with water before and after each run. The delivery from the spout shall be as close as possible to the point of deposit. When operation must be intermittent, the spout shall discharge into a hopper.

Appendix B—Developments in the Art of Making Concrete

TENTATIVE SPECIFICATIONS FOR COLD-DRAWN STEEL WIRE FOR CONCRETE REINFORCEMENT*

Material Covered.—1. These specifications cover cold-drawn steel wire to be used as such, or in fabricated form, for the reinforcement of concrete, in gages not less than 0.080 in. nor greater than 0.500 in.

Basis of Purchase.—2. When wire is ordered by gage number the following relation between number and diameter, in inches, shall apply unless otherwise specified.

Gage Number	Equivalent Diameter, Inches	Gage Number	Equivalent Diameter, Inches
0000000	0.4900	5	0.2070
000000	0.4615	6	0.1920
00000	0.4305	7	0.1770
0000	0.3938	8	0.1620
000	0.3625	9	0.1483
00	0.3310	10	0.1350
0	0.3065	11	0.1205
1	0.2830	12	0.1055
2	0.2625	13	0.0915
3	0.2437	14	0.0800
4	0.2253	..	.....

(I) Manufacture

Process.—3. (a) The steel shall be made by either or both the following processes: Bessemer or open-hearth.

Drawing.—(b) The wire shall be cold drawn from rods hot-rolled from billets.

(II) Physical Properties and Tests

Tension Tests.—4. (a) The wire, except as specified in paragraphs (b) and (c), shall conform to the following minimum requirements as to tensile properties:

Tensile strength, lb. per sq. in.	80,000
Reduction of area, per cent.	30

(b) For wire to be used in the fabrication of mesh a minimum tensile strength of 70,000 lb. per sq. in. shall be permitted.

(c) For wire testing over 100,000 lb. per sq. in. tensile strength the reduction of area shall be not less than 25 per cent.

Bend Tests.—5. The test specimen shall withstand being bent cold through 180 deg. without cracking on the outside of the bent portion, as follows:

For wire 0.3 in. in diameter or under a pin the diameter of which is equal to the diameter of the specimen.

For wire over 0.3 in. in diameter, around a pin the diameter of which is equal to twice the diameter of the specimen.

Test Specimens.—6. Tension and bend test specimens shall be of the full-size section of the wire as drawn.

Number of Tests.—7. (a) One tension and one bend test shall be made for each 10 tons or less of each size of wire.

(b) If any test specimen shows defects or develops flaws, it may be discarded and another specimen substituted.

(III) Permissible Variations in Gage

8. The diameter of the wire shall not vary more than 0.003 in. from the size ordered.

*From A. S. T. M. Tentative Standards, 1921, p. 33.

(IV) Workmanship and Finish

9. The finished wire shall be free from injurious defects and shall have a workmanlike finish with smooth surface.

(V) Inspection and Rejection

Inspection.—10. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the wire is being furnished in accordance with these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection.—11. Wire which shows injurious defects subsequent to its acceptance at the manufacturer's works will be rejected, and the manufacturer shall be notified.

Discussion

(The revision of the Manual, Appendix A of the report, was presented by the chairman of the sub-committee, W. S. Lacher (*Railway Age*). Following is an explanation of each section, J. J. Yates (chairman of the committee) moved its adoption. All clauses were approved by the Association in turn with the exception of the clause relating to the spouting of concrete.)

Mr. Lacher: The present specification makes no reference to spouting concrete. It is the opinion of the committee that the user of the specification has a right to some information, to some of the best thought, at least, on the subject of spouting, and for that reason the committee at this time submits a specification for the spouting of concrete, this being the clause that the Joint committee has now in its tentative specification. This clause does not say that spouting must be done. It still puts the matter up to the engineer on the job, but if the engineer decides that he does want to permit spouting of concrete, this clause gives him a specification under which that may be done.

Chairman Yates: *I move the adoption of this clause* for insertion in the Manual.

G. J. Ray (D. L. & W.): I should hate to see that part of the report go into the Manual at this time. As I understand the situation the committee does not recommend and will not recommend to the Association at the present time the adoption of the joint report. This clause is to bring our specification up to conform to the joint report. I think some of us do not yet agree that we should adopt the joint report, and until that is done I hardly see the necessity of putting into our specification a clause which stamps our approval on spouting. *I therefore wish to make an amendment to the motion, that this clause be inserted merely as information for the present, and not be inserted in the Manual.*

Chairman Yates: There has been a demand on the Masonry committee for a clause on spouting. We have had many discussions on this subject, both in the Joint committee on concrete and reinforced concrete, and in the Masonry committee itself, and this clause appears therein to meet that demand. It is the best we can do at the present time. It agrees quite closely with the Joint committee's report.

(*Motion as amended carried.*)

(Chairman Yates then reviewed the work of the committee with respect to the Joint committee for concrete and reinforced concrete.) * * *

Mr. Ray: I would like to call the attention of all concerned to the importance of this report. This Association is going to be called upon in another year to pass on this joint report or this tentative report which is now before us, and it is of the utmost importance that every man in the Association study that report and be prepared to submit to this committee his conclusions and recommendations with respect to it. The suggestion that the contractor will be required to make concrete which will meet definite requirements as to strength is an all-important and far-reaching proposition. My own thought

is at this time, after looking it over quite carefully, that it will mean a very material increase in the price of concrete if it is put in under that specification. I have during the past season been carrying on a few tests in an experimental way in actual practice to see what we could do ourselves in meeting the requirements of that specification. I have been amazed to find out how difficult it is for us to do it. If we cannot do it ourselves, how can we expect the contractor to know what he does when he bids on our work?

Chairman Yates: The Joint committee's report is a preliminary report, and there is no doubt there will be many modifications and changes, and we want the benefit of discussion on this matter.

(The committee was dismissed with the thanks of the Association.)

Report of Committee on Wood Preservation

A revision of the Manual covering the retention of creosote oil in timber and the permeation of the sap wood was submitted to change the specifications for the preservative treatment of wood by the empty cell process with final vacuum. As everyone who is interested desires definite information regarding tie life, nothing but completed tests should be published in the future.. Due to the price and scarcity of creosote oil, it was thought imperative that, in order to treat sufficient ties and to secure the greatest economy in tie life, the Burnett process should be used. Good creosoting offers the best protection to marine piling found so far.

C. Marshall Taylor
Chairman

C. Marshall Taylor is completing his fourth year as chairman and his twelfth year as a member of the committee. He has also been president of the American Wood Preservers' Association during the last year. Mr. Taylor is an enthusiastic advocate of the more extended use of treated timber by the railways and has done much to stimulate its consumption individually and through association activities. As superintendent of the Port Reading creosoting plant of the Philadelphia & Reading and the Central Railroad of New Jersey, he has been able to bring to the committee the combined viewpoint of the plant operator and the railway engineer.

PROPOSED CHANGES or additions to the Manual are indicated by italics in the appendices. In Appendices A, F and G the committee submitted changes and additions and recommended their adoption under the heading of "Conclusions." In Appendix B the committee submitted tables (omitted here) indicating the life of ties treated with zinc, zinc creosote and creosote, taking as a basis the service life of ties of the different kinds of woods in various sections of the country. Also, the committee made definite recommendations covering the selection, installation and record of test sections. In an Appendix D the committee on Pacific Coast Marine Piling gave the history of the protection that has been used in that territory, and also submitted information concerning the biological phases of our problem, together with records of some structures that have given excellent service in that district. The committee on Research covering Marine Piling gave a full report of the investigations that have been carried out in this country and abroad considering a problem that has come to the attention of engineers the world wide. A brief summary of this report is given in Appendix E. In Appendix F the committee submitted for adoption definite additions to the General Requirements, and which are recommended for adoption as Recommended Practice under the heading of "Conclusions." In Appendix G the committee submitted additions to the General Requirements and recommended them for adoption as Recommended Practice under the heading of "Conclusions."

Conclusions

The committee made the following recommendations to the association for adoption and publication in the Manual:

Subject (1)

(a) Revise specifications for the Preservative Treatment of Wood with Creosote Oil (Empty Cell Process with Final Vacuum).

(b) New specification for Preservative Treatment to be used on Piles and Timbers in Land Construction.

(c) New specification covering Methods for Storing Lumber and Piling for Air-seasoning Preliminary to Preservative Treatment.

Committee: C. M. Taylor (C. of N. J.), chairman; S. D. Cooper (A. T. & S. F.), vice-chairman; F. J. Angier (B. & O.), R. S. Belcher (A. T. & S. F.), H. C. Bell (N. & W.), E. H. Bowser (I. C.), Z. M. Briggs (Penna.), W. E. Burkhalter (O. W. R. R. & N.), H. A. Dixon (C. N. R.), C. F. Ford (C. R. I. & P.), Andrew Gibson (N. P.), C. E. Gosline (D. L. & W.), W. L. R. Haines (Penna.), E. B. Hillegass (A. C. L.), R. H. Howard (Wabash), A. B. Ilsley (Sou.), W. H. Kirkbride (S. P.), J. K. Melton (I. C.), J. F. Pinson (C. M. & St. P.), B. H. Prater (O. S. L.), H. von Schrenk (Cons. Engr.), W. D. Simpson (S. A. L.), O. C. Steinmayer (St. L.-S. F.), J. H. Waterman (C. B. & Q.).

Appendix A—Revision of the Manual

The committee has revised the specification for the Preservative Treatment of Wood with Creosote Oil (Empty Cell Process with Final Vacuum), as shown on page 332 of the 1920 Proceedings. The third paragraph of the specification has been changed to read as follows:

"The material shall retain an average of at least 6 pounds of creosote oil per cubic foot which will permeate all of the sapwood and as much of the heartwood as practical," and no charge shall contain less than 90 per cent nor more than 110 per cent of the quantity per cubic foot that may be specified.

Appendix B—Service Test Records

There are many different chemical preservatives used, and as creosote oil, zinc chloride, and a mixture of these two, are more widely used than the others, these only will be discussed in this report.

Of these preservatives there is no question about the use of creosote oil being preferable. Zinc chloride and a mixture of zinc chloride and creosote oil are used with much success in certain regions.

The committee is of the opinion that it will be much more desirable in the future to publish nothing but completed tests. Completed tests will be reported each year.

Zinc Chloride (Burnettizing) Process

With the present scarcity of creosote oil resulting in high prices, and the large number of cross ties to be

treated, economy demands that some other preservative be used. For some time there will not be sufficient creosote oil to treat the required number of ties. Therefore, it is imperative that the Burnett process of treatment be more widely used in order to secure the greatest possible economy in the use of ties.

Below are given the governing features for maximum service life and economy in the use of ties treated by this process:

Conditioning required for satisfactory treatment:

(1) Preliminary seasoning—Be sure that the ties to be treated have been thoroughly seasoned and that decay has not already begun.

(2) Proper treatment—To secure this the treatment should be supervised by a competent treatment inspector under the jurisdiction of the engineering department of the railroad.

(3) Subsequent seasoning—Care should be taken to see that the ties are thoroughly seasoned after treatment. They should be piled in close piles with end ties on edge (as per sketch), to prevent excessive checking.

(4) All piles should be placed in dry places and kept free from weeds.

Maximum service results will be obtained only upon observance of the following:

(1) Drainage—Good drainage of the roadbed is absolutely necessary to secure maximum results.

(2) Ballast—The ballast should be sufficient and of the best available materials, and should be kept clean.

(3) Tie plates—Tie plates of proper size and thickness should be used on all treated ties to prevent destruction by mechanical wear.

(4) Rail anchors—Use rail anchors where necessary to prevent creepage of rail, and slewing of ties.

(5) Distribution of ties—When practicable use hardwood ties on curves and softwood ties on tangents.

(6) Tie plugs—Whenever it is necessary to re-spike a treated tie, treated tie plugs should be applied, and when possible to do so the spike should be redriven into the tie plug.

(7) "S" Irons—"S" irons should be applied to hardwood ties before treatment, preferably in the woods at time of manufacture, or, if not then, immediately after the inspection.

Appendix E—Research Work on Marine Piling

Wooden piles used in marine construction have since the earliest days been subject to attack by various forms of marine borers, including members of the genera, Teredo, Xylotrya, Limnoria, Sphaeroma, etc. Very little definite information, however, is available with reference to exact distribution of the various forms, their specific identity, the conditions under which they live, influence of temperature and salinity of waters, the methods of reproduction, feeding habits and kindred points.

Realizing the international character of marine borer activities, the National Research Council was appealed to for the purpose of formulating a broad program to coordinate the various investigative activities now being conducted and to stimulate additional research work. The committee recommended that the A. R. E. A. continue to actively participate in the prosecution of the research work so necessary for a proper understanding of the habits of marine borers and methods for their control.

Recommendations: The result of examination of service records of piling on all coasts during the past few years leads the committee to recommend that good creosoting will offer the best protection so far found. By good creosoting the committee means a treatment conforming to the recommended practices of the A. R. E. A. both as to oil and treatment. It does not believe that there is sufficient knowledge as yet to warrant the use of special oils and that the A. R. E. A. No. 1 creosote oil should still be regarded as the standard for piling protection.

Appendix F—Preservative Treatment to Be used on Piles and Timbers in Land Construction

The committee recommended the following additions to the General Requirements:

Piling for Land Construction

Treatment shall be in accordance with specifications for preservative treatment of wood with creosote oil (full cell process). The net amount of oil left in the piling shall be not less than 15 lb. per cu. ft. of wood.

Timbers in Land Construction

Treatment shall be in accordance with any of the following specifications:

1. Specification for preservative treatment of wood with creosote oil (full cell process).

2. Specification for preservative treatment of wood with creosote oil (empty cell process, with final vacuum).

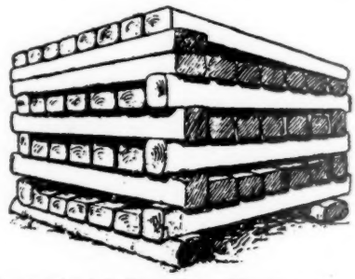
3. Specification for preservative treatment of wood with creosote oil (empty cell process, with initial air and final vacuum).

The various processes of treatment shall be so manipulated as to reach a net retention of not less than 12 lb. of oil per cubic foot in all timbers, excepting bridge ties and guard rails in which the minimum amount may be not less than 8 lb. of oil per cubic foot of wood.

Failure of some creosoted structures in the past can be attributed to untreated surfaces exposed to decay when sawing off piles, framing, and boring of holes. The committee is of the opinion that instructions for field treatment of creosoted materials are very necessary and offered the following:

Instructions for Field Treatment for Creosoted Material

All treated timber and piling which is cut or bored after treatment shall have the surfaces so exposed covered with creosote oil. Where cut, the surfaces shall be painted thoroughly with



Method of Piling Zinc Treated Ties

creosote. Where holes are bored, they shall be poured full of creosote where possible.

Horizontal holes such as those for Sway Brace Bolts shall be filled by pouring creosote into them through a bent funnel.

The creosote shall be heated before using.

Where it is absolutely necessary to bore holes in piles to support scaffolding, or for other reasons, the holes shall not be left open, but shall be poured full of creosote and a tight-fitting creosoted timber plug inserted.

Appendix G—Methods for Storing Lumber and Piling for Air-Seasoning Preliminary to Preservative Treatment

It is the opinion of the committee that the top of the treated sills or stringers used for piling and lumber should be at least 12 in. above the ground instead of 6 in., as now provided; and it is suggested that the Manual be revised to read as below, with the changes underscored:

"Material should not be treated until seasoned. If it arrives at the treating plant in a seasoned condition, ready to treat, it may be loaded directly from the cars to the trams; otherwise it shall be stacked: If ties, they should be stacked in layers of one or two and seven to ten, depending on the width of the ties, with alleys at least 3 ft. wide between rows of stacks extending between tracks, and at least 6 in. off the ground on treated sills; *if lumber, it shall be segregated according to size and each layer in the pile shall be separated by at least 1-in. strips with an air space of 1 in. or more between each piece of lumber in any layer. For caps, stringers and other large timbers, 4-in. by 4-in. strips should be used to separate layers in piling, with alleys at least 3 ft. wide between rows of stacks extending between tracks and at least 12 in. off the ground on treated sills; if piles, they shall be stored in a like manner, placing only one length in a pile, using strips 4 in. by 4 in. or saplings of equal size between each layer; reversing all sticks in every other layer in order to keep the pile level, with alleys at least 3 ft. wide between rows*

of stacks and at least 12 in. off the ground on treated sills. The space under and between the rows of stacks at all times should be kept free of rotting wood, weeds, or rubbish. The yard to be so drained that no water can stand under the stacks or in their immediate vicinity."

The following paragraph should be added as the next to the last paragraph, under General Requirements:

"In some localities, where weather conditions make it difficult to properly season piling or large timbers, it may be found desirable to locate the piles with ends to the east and west in order to secure direct rays of the sun on the ends of the sticks."

Discussion

(The report of the committee was presented by C. M. Taylor, Chairman. The section regarding the revision of the Manual on the recommended practice for the empty cell treatment with final vacuum was accepted. Mr. Taylor stated that the use of white oak for a standard test tie was acceptable to the committee. He called attention to the successful use of dating nails and urged that the railroads give this method of keeping accurate track of the life of their ties wise and serious consideration. F. J. Angier (B. & O.) stated that although he had used them for a long term of years, the Baltimore & Ohio had given up the use of dating nails, believing that they were a needless expense when considered in connection with the numerous reports which it is customary to make when they are used. G. J. Ray (D. L. & W.) stated that the Lackawanna had been using dating nails for 12 years and expected to continue as he believed the psychological effect of the nail on the foreman to be good. It was the sense of the meeting that dating nails be used in treated ties.

(The discussion on dating nails was followed by the presentation of the sections on the Preservative Treatment of Douglas Fir and the Treatment of Piles and Timbers for Marine Structures and Appendix E on Research Work on Marine Piling which were accepted as information. The sections in Appendix F dealing with the preservative treatment of piling and timbers in land construction, and the sections in Appendix G concerned with the methods of storing lumber and piling were adopted for inclusion in the Manual.

(The committee was dismissed with the thanks of the Association.)

Report on Wooden Bridges and Trestles

Following out its work on plans for wooden trestles, the committee recommended a number of plans for insertion in the Manual this year covering open deck pile and frame trestles, of both light and heavy design and a standard ballasted deck trestle. While a 12-ft. span was recommended in the progress report last year to avoid the use of large sized stringers it was thought advisable because of varying conditions to include also a 16-ft. span. The use of the open system of stringers with plank covering was considered better for ballasted deck trestles because of its convenience for repair, the lessened tendency to decay and the economical use of material.

W. H. Hoyt
Chairman

W. H. Hoyt has served as chairman of the committee for four years, prior to which he was vice-chairman for the same period. He has been intimately connected with the railway development on the Missabe range since its earliest days, having been assistant chief engineer of the Duluth, Missabe & Northern for 19 years and chief engineer for the last two years. In these capacities he has had supervision over the construction and maintenance of the large elevated ore docks of that road at Duluth. Mr. Hoyt is an enthusiastic worker in the engineering societies, particularly in the Duluth Engineers' Club and the Federated Engineering Societies of Minnesota.

In Appendix A are given the changes and addition to the Manual assigned to this committee.

In Appendix B the committee reported on wooden trestles—open deck, multiple-story and ballast-deck.

In Appendix C the committee submitted a report on fireproofing wooden bridges and trestles.

Conclusions

The committee recommended that the changes and additions to the Manual as given in Appendix A be approved. The committee recommended that the plans for standard Open-Deck Pile Trestles, Light Design; standard Open-Deck Pile Trestles, Heavy Design; standard Open-Deck Frame Trestle, Light Design; standard Open-Deck Frame Trestle, Heavy Design; and standard Ballast-Deck Trestles; be approved for printing in the Manual as recommended practice. The committee recommended that the recommendations as good practice in the report on fireproofing wooden bridges and trestles, as given in Appendix C, be approved for printing in the Manual.

Committee: W. H. Hoyt (D. M. & N.), chairman; A. O. Ridgway (D. & R. G. W.), vice-chairman; H. Austill (M. & O.), O. C. Badger (A. T. & S. F.), C. H. Blackman (L. & N.), H. J. Hansen (C. M. & St. P.), W. E. Hawley (D. M. & N.), H. T. Hazen (C. N. R.), C. S. Heritage (K. C. S.), E. M. Lewis (C. G. W.), J. B. Maddock (C. of Ga.), D. W. Smith (H. V.), L. L. Sparrow (A. C. L.), G. C. Tuthill (M. C.), A. M. VanAuken, S. L. Wonson (M. P.).

Appendix A—Revision of Manual

The committee recommended the following changes in the Definitions, now in the Manual:

Present Form	Proposed Form
Cap—The horizontal member upon the top of piles or posts, connecting them in the form of a bent.	**Cap**—A horizontal member on the top of piles or posts, connecting them to form a bent.
Straight—Having a straight line of an axis.	**Straight**—Having a right line axis.

Add the following definition:

Ballast Curb—A longitudinal timber placed along the outer edge of the floor on ballast deck bridges to retain the ballast.

Appendix B—Standard Plans for Wooden Trestles

The committee spent a large amount of time and thought on the length of spans to be recommended. In last year's progress report it suggested a 12-ft. span. After careful consideration of the advantages of a 16-ft. span, where flood conditions exist and in zones where western fir can be readily secured, it decided to include both spans. The committee carefully considered the loadings and decided to keep in harmony with those of

the steel specifications, which are Cooper's E-60 and a load which shall not be in any case lighter than three-fourths of the above. The committee believes that for any structures designed to carry more than E-60, steel and concrete will be given serious consideration.

The question of design stresses was carefully investigated and studied. Without holding too closely to fixed stresses, the committee wished to be consistent in the choice of design stresses for all four designs and has, therefore, not exceeded 1,481 lb. per sq. in. in extreme fiber in bending, and 221 lb. per sq. in. in compression between the cap and stringer. The stresses have been investigated on the basis of possible actual sizes, the minimum sizes permitted by the specifications of A. R. E. A., rather than the nominal sizes.

The committee believes that conservation of our present timber supply is necessary and therefore that the use of a 7-in. by 16-in. stringer, which can be cut from the smaller timber is a measure of conservation in that it increases the number of trees which can supply stringer material.

The committee recommended four-pile bent for the light 12-ft. span, five-pile bent for the heavy 12-ft. span, five-pile bent for the light 16-ft. span and six-pile bent for the heavy 16-ft. span, and that the same number of posts be used in timber bents as for the corresponding spans and loadings of the pile bent designs. This gives a consistent series considering the loading and spans without excessive pile loading. All but the center one or two piles are shown driven on a batter to give greater stiffness to the bent.

The committee in presenting plans for ballast deck timber trestles felt that experience indicates that the open system of stringers with plank covering was the better type because of convenience of repair, less tendency to decay and the economical use of stringer material. The committee chose the single span length stringer lapping by on the caps the full width of cap because this plan enables the use of shorter timbers, the removal and repair of one panel at a time, and where creosoted timber is used, the avoidance of cutting the stringers after treatment.

Appendix C—Recommendations on Fireproofing

All locomotives shall have adequate and well maintained spark screens in the front end and ash pans shall be maintained with a tight fit so that fires and hot coals cannot drop out.

The decks of wooden bridges shall be protected from fires starting from hot coals dropped from locomotives, preferably by adopting ballasted deck trestles; otherwise, by covering the deck with rust-resisting sheet metal or covering the stringers and caps with rust-resisting sheet metal.

When ties or other timbers are exposed, all decayed timber shall be kept trimmed off.

All brush and weeds shall be kept cut down for a distance of at least 25 ft. from the bridge, both underneath and on the embankment at the ends of the bridge. Also all sod shall be removed from under timber bridges for a distance of three feet outside of the timber.

Water barrels with buckets shall be maintained on all timber bridges, one barrel each for structures up to 50 ft. long and one additional barrel for each additional 150 ft.

On long bridges it is advisable to protect the bridge by introducing fire barriers at intervals of about 400 ft. This will reduce the hazard by preventing loss of the entire structure in case of fire.

Special fire fighting apparatus and watchman shall be employed in unusual cases where conditions warrant.

Discussion

(A. O. Ridgway (D. & R. G.) presented the matter on changes in the Manual and *moved its adoption. The motion was carried.*)

Chairman Hoyt: The second subject assigned to the committee is "Wooden Trestles—Open-Deck, Multiple-Story and Ballast Deck." *I would move the acceptance of the plans for standard open-deck trestles, light design, and also heavy design; standard open-deck frame trestle, light design and heavy design, as given in the committee's report for inclusion in the Manual.*

A. F. Robinson (A. T. & S. F.): In my opinion, this report is all right if it is submitted as a progress report and not submitted for inclusion and publication in the Manual.

There are features in these plans that I do not think any of us would want to accept in the way that they are given. There are some features that are admirable, others not so good. For example, the plans do not give any working dimensions. They say a 12-in. by 14-in. cap, a 7-in. by 16-in. stringer, and all these must have working depths. Another item on the sheet shows that the sills of frame bents are concrete. They are only frames in name. They have the braces at the bottom, but if you are to have a bent that will do service it is best to have a bent with a cap and a sill.

I do not think the longitudinal bracing has been carefully studied out.

To go to the ballast deck, you will find 8-in. by 8-in. ballast guards with vertical bolts down through them. You will not be able to hold these in that position without "S" straps.

It would be interesting, perhaps, to know something about how the unit stresses in the stringer run. I note that they show 7 in. by 16 in. stringers and 9 in. by 18 in. The plans also show 12 in. by 14 in. caps, and also 14 in. by 14 in. They ought to be made one or the other.

In running over hurriedly the 12-ft. panels, the light design, I find that they allow the impact conditions that are required by our steel bridge specifications under the E-60 loading, in which case the fibre stresses show 3,290 lb. per sq. in. In the 16-ft. panel, light design, the fibre stresses in the stringers E-60 are 3,520 lb. Another feature is that we are figuring now on the E-60 loading, but we are going to get heavier loading and we must provide in advance for further increases. Let us hold off for another year; until the committee can get the question of impact and unity stresses in line and have their plans thoroughly and properly worked out. I do not believe any of you would accept the plans presented for drafting room work. I hope the committee will change their recommendation and submit the plans as a progress report.

Chairman Hoyt: Mr. Robinson has referred to several items that will come up later. We are only submitting now the four standard for light and heavy, pile and frame trestles. The committee did not ignore the question of impact by any means. It was thoroughly and carefully considered, but in submitting the plans the committee did so on the basis that the design was amply strong to take care of the strains within reasonable limits, as they would be applied. In adopting the E-60 it was assumed—and I think rightly—that most roads will give consideration to their steel or concrete structures. That is the basis on which they arrive at these points.

On the matter of simplifying the number of spans, it seemed impossible to submit a standard trestle with a

standard stringer, or a standard cap that would fit all conditions. It was the aim of this committee to submit something toward which the designs can be brought, in order to bring about more or less standardization and provide a larger market for standard sized timbers and as to various other points.

Mr. Robinson: As these plans are designed, they will oblige us to use fir timber almost entirely for our stringers. When you get to the 9-in. by 16-in., it is practically impossible to obtain southern pine that is more than 16 in. in depth for stringers. We should not make our design so that it will rule out all of the territory that is supplied with material and stringers from the south.

E. A. Frink (S. A. L.): I would go further than Mr. Robinson in regard to the size of the stringers. Instead of saying that the stringer should not be over 16 in., I would say that 14 in. would be sufficient. We must not make the mistake of placing too great importance on theoretical designs in a matter where some of the assumptions are somewhat doubtful.

(*The motion made by Chairman Hoyt for the adoption of the designs of trestles was carried.*)

Chairman Hoyt: *I move that the report of the committee for multiple story trestles be approved and printed in the Manual.*

(*Motion carried.*)

Chairman Hoyt: *I move that the recommendation of the committee for ballast for trestles be approved and printed in the Manual.*

(*Motion carried.*)

(The recommendations on fireproofing were approved for printing in the Manual. The committee was then excused.)

Report on Rules and Organization

Some revision of the Manual in respect to the duties of signal maintainers was thought necessary in order to make such rules harmonize with the rules of the signal section of the A. R. A. A part of the report, covering rules of conduct of work, signals and interlocking, was recommended for insertion in the Manual as an addition to the Manual of Rules for the Guidance of Employees of the Maintenance of Way Department. An organization should be developed on the railways which would be responsible for the proper handling of mechanical work equipment and tools. The head of this organization should be a supervisor of work equipment.

W. C. Barrett
Chairman

W. C. Barrett, who is now completing his second year as chairman of the committee and his fourth year as a member of the committee, has been able to bring to it the mature viewpoint of the operating officer with an engineering training. As a trainmaster on the Lehigh Valley and formerly a division engineer, he is in a position to appreciate the importance of well thought out, practical rules for the guidance of employees engaged in the maintenance of railway tracks and structures. Mr. Barrett is a thorough student of fundamental problems and has brought to the work of this committee the results of intensive study to the advantage of that work.

THE COMMITTEE SUBMITTED its report on revision of the Manual in an Appendix A. In its Appendix B the committee recommended for adoption and printing in the Manual, rules for conduct of Signal Work, and presented for information only, rules for the conduct of bridge and building work. The use of mechanical appliances and tools, and organization of labor involved was covered in Appendix C and presented for information only.

Conclusions

1. The committee recommended the adoption of that portion of Appendix A covering duties of signal maintainers, and that these rules be substituted for those now appearing in the Manual under the same heading.

2. The committee recommended the adoption of that portion of Appendix B covering rules for conduct of work, Signals and Interlocking, to be added to the "Manual of Rules for the Guidance of Employees of the Maintenance of Way Department," and printed in the Manual.

Committee: W. C. Barrett (L. V.), chairman; E. H. Barnhart (B. & O.), vice-chairman; F. D. Anthony (D. & H.), D. P. Beach (Penna.), H. L. Browne (C. B. & Q.), S. E. Coombs (N. Y. C.), J. L. Downs (I. C.), H. H. Edgerton (C. G. W.), J. M. Fair (Penna.), R. H. Gaines (T. & P.), R. H. Hallsted (Mo. Pac.), H. H. Harsh (B. & O.), B. Herman (Sou.), E. F. Manson (C. R. I. & P.), E. L. Martin (M. K. & T.), R. N. Priest (A. T. & S. F.), R. E. Warden (M. P.), A. A. Woods (Sou.).

Appendix C—Use of Mechanical Appliances and Tools

The committee recommended the following organization for handling and care of the work equipment of a railroad. At the head of this organization there should be a supervisor of work equipment, reporting to the chief engineer, or to the chief engineer of maintenance. This officer's duties include the following:

He has charge of all work equipment including—Hoists or clam shells, in the yards, at the roundhouse or out on line; hoists in the store department; steam shovels; ditchers; spreaders; motor cars; weed mowers; tie tampers; rail layers; portable rail saws, etc.

He arranges for systematic inspection of equipment.

Instructs operators in charge of equipment.

Has charge of all equipment inspectors.

Has general supervision over district or division repairmen on special equipment.

Arranges for distribution of equipment and transfer of equipment when so directed by his superior officer.

He has charge of repair shops where machines are repaired if there is sufficient work to justify one shop, otherwise he instructs and directs shop superintendent as to nature and amount of repairs to be done.

Engineers on hoists and every one above the rank of laborer on all steam work equipment are employed by the supervisor of work equipment and then are turned over to the division forces. But, they must be satisfactory to the division men to whom they report. They are responsible only to the supervisor of work equipment for care of the machine they are in charge of.

Organization of Outfits

Steam Shovels.—The equipment moved over the system as a unit includes a shovel, a bunk car, a tool car and dump cars. The crew comprises an engineer, a craneman, a fireman and a watchman. They are employed by the supervisor of work equipment and carried on the division payroll.

Ditchers: Each one is considered as a complete unit and moved together over the system. It consists of a ditcher, a flat car, a dump car, a bunk car, a spreader and a clam shell attachment.

The crew comprises an engineer and a fireman, employed as wanted through the supervisor of work equipment. Labor is employed by the division where the machine is in operation.

Locomotive crane: Includes a crane, a bunk car and a boom car. The crew comprises an engineer and a fireman, employed as wanted by the supervisor of work equipment.

Spreader: One operator, employed as wanted by the supervisor of work equipment.

Portable Rail Saw. (Industrial Iron Works, Bay City, Mich.)—Mounted on a car and moved over the system. Has no power of its own. Uses a locomotive to furnish steam. Takes a day to dismantle and three days to set up. The side rods are taken off the locomotive and it is then blocked to the track and is used as a stationary boiler. The crew includes a foreman, an engineer, a craneman and a fireman, employed by the supervisor of work equipment and carried on the division payroll. Laborers, employed by the division, 2 drillers, 2 chippers, 2 on car old rail is on; 2 air hoists; 5 tablemen; 2 loaders; 3 on the ground at odd jobs. The largest output is 376 rails complete in 8 hours, drilled, chipped, and loaded on cars. Average daily run during the year, 366 rails.

System of Repairs.—Inspected. Repair parts ordered and sent to where repairs are to be made. Work list is made out showing what is to be done. Engineer of the machine is sent to the shop where the repairs are made and oversees the work done.

Distribution of Machines.—The distribution for the season is fixed by the supervisor of work equipment in conference with the chief engineer or chief engineer maintenance of way, or whoever decides for the whole system what the outline of the season's expenditures is going to be. Points to consider: Men who operate the machines should be so assigned as to be nearest their homes. New machines should be put on the hardest work. Sources of water and fuel for the machines come in for thorough consideration. The individuality of the men is better adapted to some locations than to others. A little powder work of blasting can be done by some men and not by others.

Division Repair Shops.—These are used for motor cars only, but they can also be used to repair track mowers and other small maintenance of way equipment.

Motor Cars.—District Inspector.—One to about 4,000 miles—700 cars. Reports to engineer maintenance of way of the district. Looks after motor cars and tie tampers.

Division Inspectors.—One or two motor car inspectors to each division, 30 to 40 cars to each inspector. Reports to division engineer.

Each has a standard list of parts, and keeps in stock one or two extra power plants, motor engines for the cars. He travels on a motor car of his own, and carries an outfit of tools, and small repair parts. He makes minor repairs and adjustments in the field and instructs the foremen in the care and operation of the cars. If he finds a bad power plant on a car, too bad to be repaired on the ground, he sends in for his extra engine and when it arrives installs it. Does not handle steam shovels or water service.

Reports on Motor Cars.—Each car the inspector inspects and repairs he reports on and the report is signed by the foreman, to whom car is assigned. This gives the supervisor information on what their foremen are doing to keep up their cars.

Discussion

(The report was presented by W. C. Barrett, Chairman.)

Chairman Barrett: In taking up the work of promulgating rules for signal interlocking, we discovered that the signal section of the American Railway Association had formulated rules covering the duties and work of signal maintenance employees and these rules had been approved by the American Railway Association, so this committee thought it would be proper for us to go over our rules already in the Manual covering signal maintenance, and make them agree with the rules already formulated by the signal section and approved by the American Railway Association. *I move you that the rules for signal maintenance be approved by this Association for printing in the Manual.*

C. E. Lindsay (N. Y. C.): Did the committee consider these rules from a strictly maintenance standpoint, and are there any objections to them from that standpoint?

Chairman Barrett: The rules were really gotten up in the first place largely from that standpoint, and the only revision was in order to make them agree with the rules that the signal section had promulgated.

(*Motion carried.*)

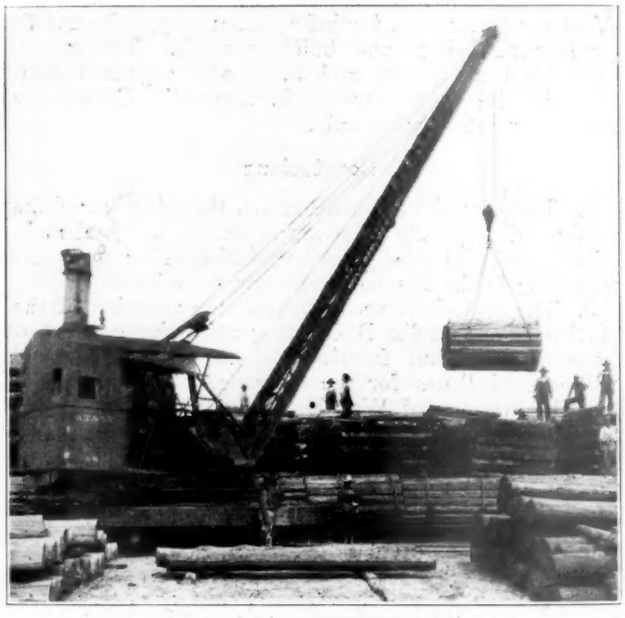
Chairman Barrett: *I move that the report of Appendix B covering signals and interlocking, be approved by this Association for printing in the Manual.*

(*Motion carried.*)

(The balance of the information in Appendix B was then presented and accepted as information only, as well as Section 3 on the use of mechanical appliances and tools and the organization of labor, after which the committee was dismissed with the thanks of the Association.)

Closing Business of the Association

With the closing of the presentation of the committee reports E. A. Frink (S. A. L.), stated that a number of members of the Association had said that they did not understand the situation regarding the American Engineering Standards Committee. This committee does no constructive work on the formation of standards—it is simply in effect a clearing house, an executive body that considers forms of standards submitted by interested bodies. He thought that it would not be necessary to get standards into finished form before submitting them to the Standards committee, thus saving time and labor by letting that committee do the work. C. A. Morse (C. R. I. & P.) took exception to this, stating that it was the duty of the Association in working with the Standards committee to see that the work of the committee did not interfere with good practice on the railroads. J. L. Campbell (E. P. & S. W.) moved that the relation of the A. R. E. A. to the A. E. S. C. be referred to the Board of Direction with power to act. Following this motion, the new President, Mr. Campbell, took the chair and after a short talk, declared the convention adjourned.



At the Albuquerque Timber Treating Plant of the Santa Fe